

at which surface an electron-emitting device is disposed, wherein the SiO_2 layer has a plurality of partially exposed metal oxide particles on its surface, and a plurality of enclosed metal oxide particles.

5 In accordance with the present invention, there is further provided an electron source comprising a substrate and an electron-emitting device arranged on the substrate, wherein the substrate is one of the above-described electron source forming substrates.

10 In accordance with the present invention, there is further provided an image display apparatus comprising an envelope, an electron-emitting device arranged in the envelope, and an image display member adapted to display images through application of electrons from
15 the electron-emitting device, wherein the substrate on which the electron-emitting device is arranged is one of the above-described electron source forming substrates.

20 BRIEF DESCRIPTION OF THE DRAWINGS

 Figs. (1A) and (1B) are schematic sectional views showing an example of the electron source forming substrate of the present invention;

 Figs. (2A) and (2B) are schematic diagrams showing an
25 example of the electron source of the present invention, of which Fig. 2A is a plan view and Fig. 2B is a sectional view;

Figs. (3A) and (3B) are enlarged schematic partial views of an example of a surface conduction electron-emitting device applicable to the electron source of the present invention, of which Fig. 3A is a plan view and Fig. 3B is a sectional view;

Figs. (4A) and (4B) are enlarged schematic partial views of another example of a surface conduction electron-emitting device applicable to the electron source of the present invention, of which Fig. 4A is a plan view and Fig. 4B is a sectional view;

Figs. (5A), (5B), (5C) and (5D) are schematic diagrams illustrating procedures for manufacturing an electron source according to the present invention;

Figs. (6A) and (6B) are schematic diagrams showing waveforms of a pulse voltage used in the manufacture of the electron source of the present invention;

Fig. (7) is a schematic diagram showing a construction example of the electron source of the present invention;

Fig. (8) is a schematic diagram showing a construction example of the image-forming apparatus of the present invention;

Figs. (9A) and (9B) are schematic diagrams showing the construction of a fluorescent layer used in the image-forming apparatus of the present invention;

Fig. (10) is a block diagram showing an example of a drive circuit;

Fig. 11 is a schematic diagram showing the general construction of an apparatus used to produce an image-forming apparatus;

Fig. 12 is a diagram illustrating a connection method for the forming and activation processes for the image-forming apparatus of the present invention;

Fig. 13 is a schematic diagram showing another construction example of the electron source of the present invention; and

Fig. 14 is a schematic diagram showing another construction example of the image-forming apparatus of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

In accordance with the present invention, there is provided an electron source forming substrate which has an insulating material layer on the surface thereof on which an electron-emitting device is arranged, wherein the insulating material layer has a plurality of partially exposed metal oxide particles on its surface.

Further, in accordance with the present invention, there is provided an electron source forming substrate which has an insulating material layer on the surface thereof on which an electron-emitting device is arranged, wherein the insulating material layer has a plurality of partially exposed metal oxide particles on its surface, and a plurality of enclosed metal oxide